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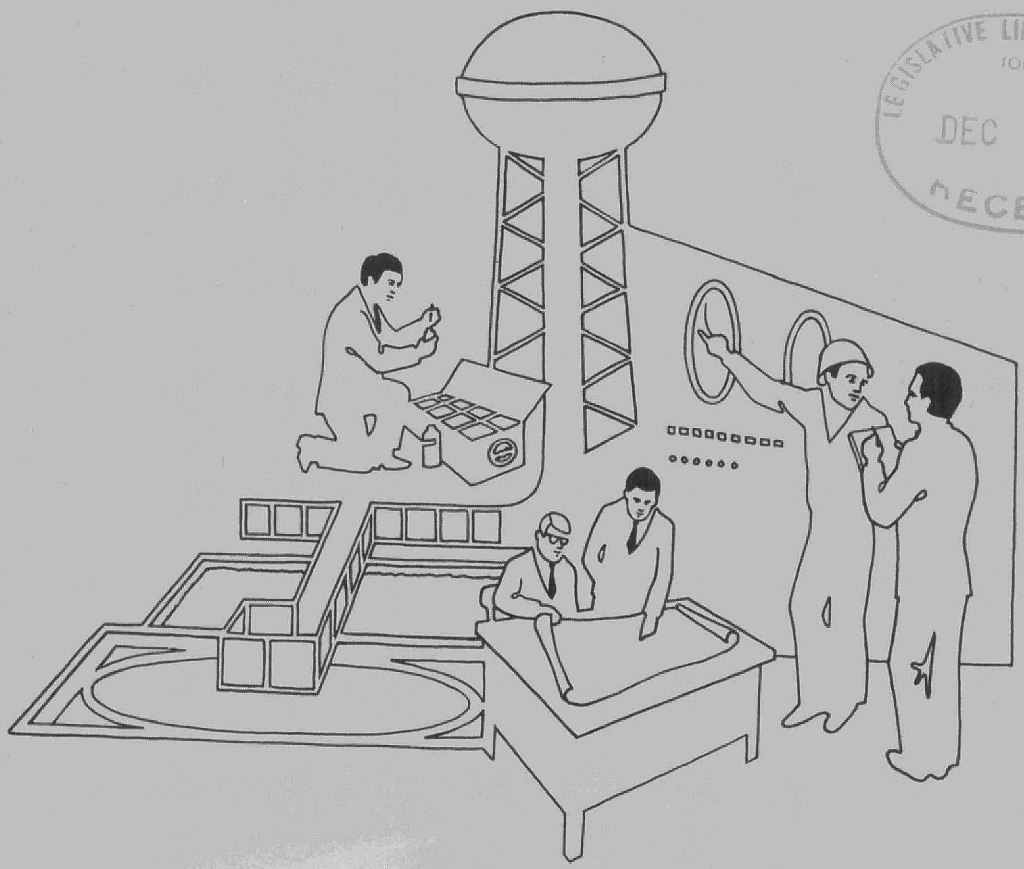

MIDDLE MAITLAND RIVER

WATER QUALITY SURVEY

July 1971

ONTARIO WATER RESOURCES COMMISSION

REPORT

ON THE

WATER QUALITY SURVEY

OF THE

MIDDLE MAITLAND RIVER

DATES OF SAMPLING: July 19 to 28, 1971

PREPARED BY: F. W. HICKS, Civil Technologist

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INTRODUCTION

A survey of the Middle Maitland River was undertaken in order to obtain information on the water quality and to determine the effect of discharges to the river. The survey commenced at a point two miles upstream of the Town of Listowel and terminated 2 miles downstream of the Village of Brussels, a total distance of approximately 28.2 miles. The field work was completed during the period July 19 to 28, 1971. It consisted of a visual inspection of the stream and adjoining lands. Samples were collected of the river as well as all inputs, including the Town of Listowel, Village of Brussels, tributaries and agriculture drainage.

Storm drain discharges in the Town of Listowel were sampled on June 30, and August 17, 1971. The results of these samples are included with this report.

STREAM USAGE

The Middle Maitland is used primarily for livestock watering as well as recreational activities such as swimming and fishing. In addition, the river is the ultimate receiving stream for treated effluent discharges from the waste stabilization ponds at Listowel.

STREAM FLOWS

Flows in the Middle Maitland are generally low, with the exception of the spring run-off. While minimum flows of 0 cubic feet per second (cfs) have been recorded on occasion, the summer discharge rates are generally in the range of 1 to 2 cfs.

Sudden rains can increase the flow by as much as 800 per cent for short durations but the river will return to normal within 3 to 4 days.

At the time of this survey it was estimated that the flow did not exceed 4 cfs.

DISCUSSION OF SAMPLE RESULTS

The laboratory results of samples collected during this survey and the June 30 and August 17 surveys of the Town of Listowel are appended to this report as Tables I,II and III. A map showing the sampling points is attached.

For ease of discussion, the sample results will be divided into three categories:

1. River samples.
2. Storm drain discharges from Listowel and Brussels.
3. Discharges in the agricultural areas and tributaries to the Middle Maitland River.

River Samples

A perusal of the results of the river samples reveals that there was little change in the BOD, total nitrogen and total phosphorous concentrations over the 28 miles of the river surveyed.

In general the BOD concentration of the majority of the samples collected was less than 2 ppm. Of the six samples exhibiting excessive BOD's, one (MM69.1 BOD 30ppm) is attributable to an industrial waste discharge and the remainder are apparently the effects

of agricultural discharges.

The average concentrations for total nitrogen and total phosphorous were 1.0 ppm and 0.21 ppm, respectively. As with the BOD's, these were sometimes influenced by upstream discharges. At sampling point MM86.6 values of 2.1 ppm N and 0.78 ppm P were obtained immediately downstream of a poultry farm. A sample of the effluent from a tile drain on the property had concentrations of 9.4 ppm N and 1.4 ppm P.

The concentrations of nitrogen and phosphorous found in the river were sufficiently high to promote excessive growths of aquatic vegetation.* From a point about one mile upstream of Listowel to three miles below Trowbridge dense growths of aquatic vegetation (identified by the OWRC Laboratory as predominantly Spirogyra sp.) virtually choked the river. In areas where the depth or velocity of the water increased, the density of the growths decreased considerably. Further downstream, the bottom was sandy, (as opposed to the mud bottom found upstream) and aquatic growths were sparse except in quiescent areas.

About eight miles upstream of Brussels, the river became wider and deeper, and the velocity decreased. In this area the growths of algae occurred primarily along the stream banks. The dam at Brussels influenced the river for approximately 2 1/2 miles

* It has been found that concentrations of nitrogen in excess of 0.5 ppm and phosphorous in excess of 0.03 to 0.04 ppm tend to promote the growth of algae and other aquatic plants.

upstream resulting in increased depths and reduced velocities.

While it has been reported that at other times of the year heavy aquatic growths were choking the river behind the Brussels dam, at the time of this survey algae growths were found to be negligible.

Downstream from the Brussels dam to the end of the survey, a distance of approximately two miles, the river was very wide and shallow with a rocky bottom, and no significant algae growths.

Town of Listowel

Approximately 75 per cent of the Town of Listowel is served by a separate sewer system.

The results of the samples collected on June 30 and August 17, 1971 (Table II) revealed the presence of pollutants in most of the outlet drains to the Middle Maitland River. The main waste contribution in the unsewered area comes from the Albert Ave. Drain. This source of pollution should be eliminated next year when sanitary sewers are constructed in this area. It is also noted that a comprehensive engineering study is underway which will provide the Town of Listowel with detailed information regarding future sewerage needs.

The Wallace Ave. North and Elma Street West drains are the main sources of wastes in the predominantly sewered area. Surveillance of these is required to locate and correct the sources of contamination.

With regard to the other drains, it would appear that some private sanitary connections to the storm sewer system still exist.

These improper connections should be located and redirected to the sanitary sewers.

Village of Brussels

The Village of Brussels, with a current population of 857 persons, (1971 municipal directory) does not have a communal sewage collection and treatment works. Domestic sewage disposal facilities consist of individual septic tank and tile field systems or cesspools. The village is served by six storm drains all of which outfall to the Middle Maitland River.

The six outfalls were sampled during this survey. The laboratory results pertaining to these samples may be found in Table II, appended to this report. A review of the results indicates that all of the drains were discharging inadequately treated domestic and/or industrial wastes. Most of the discharges (e.g. MM69.3W and MM68.8WB) had the typical appearance and odours of septic tank effluent.

The village should take action to eliminate these sources of pollution. The ultimate solution will probably be the construction of a sewage collection system and treatment works.

Agriculture Discharges and Tributaries

Within the Middle Maitland River watershed, beef farming and dairy farming are the main enterprises. Along the survey route between Listowel and Brussels, cattle had unlimited access to the river.

At numerous locations the grass cover was destroyed, the banks trampled down and erosion was evident. Accumulations of cattle droppings were also observed along the river banks. Remains of manure piles were found at two locations. (eg. MM87.0F and MM90.2F)

Numerous points of run-off from fields adjoining the stream were noted. Thirteen had sufficient flow to permit sampling. Laboratory analyses indicated low BOD values, and the presence of nitrogen, phosphorous, and fecal coliforms. The nuturient concentrations, while low, indicate that run-off from adjoining farm lands does contain these elements. There will be an accumulative effect resulting in increased concentration of nutrients in the river. The fecal coliform densities in some cases were sufficiently high to suggest strongly that these waters contain waste discharges from warm blooded animals.

There are nine streams tributary to the Middle Maitland River in the study area, five of which contained significant flows at the time of the survey. These are Beauchamp Creek, Boyle Drain, Chapman Drain and two unnamed tributaries orginating near Gowanstown and Atwood. Chemical analyses of samples taken from those tributaries generally exhibit similar characteristics to those from the Middle Maitland River. However, significantly higher results were noted in the samples from the Gowanstown tributary and the Chapman Drain.

With regard to the Gowanstown tributary, the BOD and suspended solids concentrations of 44 and 160 ppm respectively, are unusually high and cannot be readily explained. At the time of the sampling a herd of cattle was observed grazing in and beside the stream about 300 feet above the sampling point which could possibly account for some of the high BOD.

Samples were taken at two points on the Chapman Drain, one at a point 200 feet from the Middle Maitland and the other about 100 feet upstream of the waste stabilization pond outfall. These indicated the presence of BOD and nutrient compounds. There is a difference in the nitrogen concentrations, which could possibly be due to the fact that the samples were not taken on the same day. It is interesting to note that the drain contained significant amounts of BOD and nutrients, even though the lagoon had not been discharged since mid-May, 1971.

SUMMARY

During the period of July 19 to 28, 1971, 28 miles of the Middle Maitland River was surveyed from above Listowel to below Brussels. Storm drains and other discharges in the Village of Brussels were sampled at this time. Storm drain and other discharges in the Town of Listowel were sampled on June 30, and again on August 17, 1971.

Most of the storm drains in the Town of Listowel were found to be discharging pollutants to the Middle Maitland River.

With the anticipated completion next year of the sewer project for the north-west part of town, a major portion of the pollutants will be eliminated. The remaining sources of pollution in Listowel are minor. The construction of local sewers on certain streets and the severance of any remaining domestic services from the storm sewer system will eliminate these.

All of the outfalls in the Village of Brussels were found to be discharging inadequately treated domestic and/or industrial wastes.

In the rural areas, the section of the Middle Maitland between Listowel and Brussels, a large number of cattle had unrestricted access to the river and constituted a significant potential source of contamination.

The BOD was relatively low and within acceptable limits. The total nitrogen and total phosphorus concentrations were found to be sufficiently high to promote excessive growths of aquatic vegetation.

Evidence of cattle droppings and manure piles by the river's edge were noted at numerous locations. Samples of runoffs from areas bordering the river showed the presence of nitrogen and phosphorus compounds.

Samples of tributaries discharging to the Middle Maitland also showed similar characteristics to those samples from the Middle Maitland River. However, Gowanstown tributary and the Chapman Drain showed significantly higher results.

At the time of the survey, the lagoon had not been discharged since the middle of May 1971, 2 1/2 months earlier.

CONCLUSIONS

1. Nitrogen and Phosphorus concentrations in the Middle Maitland River were sufficient to promote excessive aquatic growth.

2. Inadequately treated domestic and/or industrial wastes were being discharged to the river in the municipalities of Listowel and Brussels.

3. Nitrogen and Phosphorus compounds were gaining access to the river from field and farm run-offs.

4. Cattle having direct access to the river present a potential source of pollution and increase the rate of erosion of the river banks by their entry and exit.

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Rev. November 1971

APPENDIX A

ABBREVIATIONS & SYMBOLS

Engineering Terms

BOD - Biochemical Oxygen Demand
S.S - Suspended Solids
N. - Nitrogen
P. - Phosphorous
ABS - Alkyl Benzene Sulfonate
T. - Turbidity Units
V. - Velocity
ppm - parts per million
gpm - gallons per minute
fps - feet per second

Miscellaneous

L - Lower than
G - Greater than
ML - Milliliters
MF - Membrane Filter
' - feet
" - inches
ϕ - diameter

TABLE I

ANALYSES OF

RIVER SAMPLES

July 28, 1971 Mile Pt.	Description Middle Maitland River Survey River Samples	5-Day BOD (ppm)	S. S. or Turb. Units	Total N (ppm)	Total P (ppm)	Coliform Total Per 100 ML. (M.F.)	Coliform Fecal Per 100 ML. (M.F.)
MM67.4	River sample.	2.0	1.5T	1.1	0.10	1,800	24
MM68.8	River sample - west limits of town of Brussels.	2.4	1.0T	0.98	0.069	29,000	540
MM69.1	River sample near outfall from Huron Food Products.	30	4T	1.3	0.34	1,130,000	20,000
MM69.4	River sample at main bridge in Brussels River is clear with frog and fish life.	2.8	4T	0.70	0.079	2,900	56
MM69.9	River sample below dam ponding area.	2.0	1.5	1.0	0.069	6,900	48
MM69.9	River sample above dam.	2.6	1.5T	1.1	0.12	3,600	24
MM70.3	River sample.	1.6	1.5T	0.95	0.13	4,200	76
MM70.8	River sample.	1.4	1.0T	1.1	0.12	2,500	280
MM71.3	River sample.	1.0	1.5T	0.82	0.12	1,900	60
MM71.8	River sample.	1.2	1.0T	0.92	0.16	3,900	84
MM72.3	River sample.	1.2	1.0T	0.92	0.13	2,800	60
MM72.7	River sample.	1.0	L1.0T	0.80	0.16	2,000	84
MM73.2	River sample.	1.0	1.0T	0.76	0.14	3,400	68
MM73.7	River sample.	0.8	L1.0T	0.83	0.14	2,600	48
MM74.2	River sample.	1.2	1.5T	1.0	0.14	2,100	76

July 28, 1971 Mile Pt.	Description Middle Maitland River Survey River Samples	5-Day BOD (ppm)	S. S. or Turb. Units	Total N (ppm)	Total P (ppm)	Coliform Total Per 100 ML. (M.F.)	Coliform Fecal Per 100 ML. (M.F.)
MM74.6	River sample.	0.8	1.0T	0.82	0.12	2,200	160
MM75.1	River sample.	1.0	1.0T	0.79	0.14	3,000	72
MM75.6	River sample.	1.2	1.5T	0.84	0.14	1,600	48
MM76.1	River sample.	1.8	1.5T	1.1	0.14	2,700	72
MM76.5	River sample.	0.8	1.5T	0.98	0.15	2,700	124
July 27, 1971							
MM77.0	River sample.	1.6	3	1.1	0.25		
MM77.1	River sample.	1.4	L1.0	0.84	0.17	1,600	96
MM77.5	River sample.	1.0	L1.0T	0.80	0.16	1,600	48
MM78.0	River sample.	0.6	L1.0T	0.80	0.17	2,800	60
MM78.4	River sample.	0.6	L1.0T	0.80	0.17	1,000	40
MM78.9	River sample.	0.8	L1.0T	0.85	0.18	1,700	60
MM79.9	River sample.	0.8	L1.0T	0.88	0.18	1,500	52
MM80.4	River sample.	1.0	1.0T	0.76	0.16	1,200	40
MM81.3	River sample.	2.2	1.5T	0.76	0.28	1,600	36
MM81.8	River sample.	1.4	2.0T	0.76	0.28	1,900	60
MM82.3	River sample.	0.6	3T	0.84	0.30	3,200	48

July 27, 1971 Mile Pt.	Description Middle Maitland River Survey River Samples	5-Day BOD (ppm)	S. S. or Turb. Units	Total N (ppm)	Total P (ppm)	Coliform Total Per 100 ML. (M.F.)	Coliform Fecal Per 100 ML. (M.F.)
MM82.8	River sample.	1.2	4T	0.87	0.30	Lab. Accident	
MM83.2	River sample.	1.4	6T	0.94	0.30	3,000	110
MM83.7	River sample.	1.4	1.0T	0.91	0.34	5,500	52
MM84.15	River sample.	1.6	2.0T	1.1	0.42	1,900	0
MM84.2	River sample.	2.0	5	0.98	0.43	1,200	68
MM84.7	River sample.	1.6	4	1.1	0.38	1	1
July 21, 1971							
MM85.1	River sample.	1.4	3	0.94	0.34	0	0
MM86.6	River sample.	4.2	100	2.1	0.78	120	1
MM87.1	River sample.	2.0	2	0.81	0.28	1,500	12
MM87.6	River sample.	1.0	2	0.82	0.21	120	0
July 20, 1971							
MM88.55	River sample.	1.4	2	0.99	0.26	12,900	420
MM88.6	River sample.	1.2	4	0.76	0.16	150	0
MM89.6	River sample.	1.6	15	0.78	0.12	30,000	0
MM90.1	River sample.	6.5	25	2.1	0.32	1,610	370
MM90.6	River sample.	1.6	5	0.53	0.22	164	4

July 20, 1971 Mile Pt.	Description Middle Maitland River Survey River Samples	5-Day BOD (ppm)	S. S. or Turb. Units	Total N (ppm)	Total P (ppm)	Coliform Total Per 100 ML. (M.F.)	Coliform Fecal Per 100 ML. (M.F.)
MM91.9	River sample.	0.8	35	0.28	0.056	0	280
MM91.6	River sample.	2.2	10	0.67	0.39	88	0
MM92.1	River sample.	2.4	15	2.1	0.37	1,900	1
July 19, 1971							
MM94.1	River sample.	7.5	80	3.0	0.26	1,400	36

T A B L E II

ANALYSES OF

STORM DRAIN DISCHARGES

- Town of Listowel
- Village of Brussels

WATER POLLUTION SURVEY

TOWN OF LISTOWEL

TABLE II

Sampling Point	Description of Sampling Point	5-Day BOD (ppm)	Solids			Fecal Coliform Count per 100 ml.	MF Coliform Count per 100 ml.	Estimated Flow (gpm)	Date of Survey
			Total (ppm)	Susp. (ppm)	Diss. (ppm)				
1	Catch Basin at foot of Walton Street	14	500	20	480	12,000	4,400,000	½	30 June
2	Maitland Ave. Drain	20	950	110	840	L 4	L 4	½	30 June
3	North Drain at Queen St. and Davidson Ave.	3.2	600	3	597	680	4,800	Trickle	30 June
		32		20		6,200,000	440,000,000	1.2	17 Aug.
4	Wallace St. Drain at bridge	110	420	35	385	2,300	170,000	6	30 June
		L 0.5		3		60	14,000	4	17 Aug.
5	West outfall between Main St. and Elma St.	2.8	310	2	308	360	10,000	1	30 June
		G 30		5		150	36,000	1	17 Aug.
6	West Drain at Elma St. bridge	75	440	70	370	6,000	60,000	5	30 June
		190		160		340,000	340,000	5	17 Aug.
7	West Tile South of Target Discount	140	550	60	490	30,000	23,000,000	Periodic Flow	30 June
								Dry	17 Aug.

WATER POLLUTION SURVEY

TOWN OF LISTOWEL

TABLE II

Sampling Point	Description of Sampling Point	5-Day BOD (ppm)	Solids			Fecal Coliform Count per 100 ml.	MF Coliform Count per 100 ml.	Estimated Flow (gpm)	Date of Survey
			Total (ppm)	Susp. (ppm)	Diss. (ppm)				
8	West Drain at Hays Coal Yard	4.8	310	5	305	5,000	80,000	3	30 June
		8		45		9,000	170,000	3	17 Aug.
9	East Drain at Elma St. Bridge	2.0	370	2	368	208	2,900	½	30 June
		0.6		4		72	1,400	4	17 Aug.
10	East Drain at Elma St. Bridge	4.0	1,000	30	970	20	130,000	Trickle	30 June
								Dry	17 Aug.
11	Albert Avenue Drain at Main Street	40	650	55	595	290,000	2,200,000	15	30 June
12	East Drain South of Elizabeth Street	2.8	500	1	499	1,200	13,000	¼	30 June

July 28, 1971 Description

Mile Pt.	Middle Maitland River Survey "Village Limits of Brussels"	5-Day BOD (ppm)	S. S. or Turb. Units	Total N (ppm)	Total P (ppm)	Coliform Total Per 100 ML. (M.F.)	Coliform Fecal Per 100 ML. (M.F.)
MM68.8WA	12-inch diameter outfall near Horicultural Park.	1.2	1.0T	0.59	0.24	79,000	5,300
MM68.8WB	4-inch diameter tile near Horicultural Park -black odourous septic tank effluent.	110	70T	13 ABS -L0.5 ppm	1.9	190,000	200,000
MM69.1W	8-inch diameter sewer from Huron Food Products Ltd. White and grey ponding -strong odours -estimated flow 20 gpm	34	8T	0.90	0.29	11,000,000	960,000
MM69.2W	12-inch diameter outfall for Elizabeth St. sewer small steady flow -grey and black colour	8.0	3T	7.4 ABS - L0.5 ppm	2.8	550,000	360,000
MM69.2W	Effluent from overflowing spring near Huron Food Products Ltd. -algae growth in ditch.	1.0	L1.0T	0.14	0.016	0	0
MM69.3W	6" tile - black odoureus septic tank effluent -appears to be from Top Notch feeds Ltd. -no flow at inspection but had flowed that day.	G395	150T	120.0	27.0	240,000,000	13,000,000

July 28, 1971 Description

Mile Pt.	Middle Maitland River Survey "Village Limits of Brussels"	5-Day BOD (ppm)	S. S. or Turb. Units	Total N (ppm)	Total P (ppm)	Coliform Total Per 100 ML. (M.F.)	Coliform Fecal Per 100 ML. (M.F.)
MM69.6W	12-inch diameter outfall for William St. sewer -small steady flow	1.0	L1.0T	0.76	0.25	22,000	1,000
MM69.8T	Small stream near dam flowing parallel to dam joins Middle Maitland River farther along.	0.6	L1.0T	0.35	0.018	3,700	720
MM69.8T	Small stream on south side of river - suspected source a spring	2.8	4T	1.0	0.86	8,000	980
MM69.9	River sample below dam ponding area.	2.0	1.5	1.0	0.069	6,900	48

T A B L E III

ANALYSES OF

(W) - Outfalls

(T) - Tributaries

(G) - Ground Seepage

(F) - Field or Farm Run-Off

Mile Pt.	Description Middle Maitland River Survey "Outfalls"	5-Day BOD (ppm)	S. S. or Turb. Units	Total N (ppm)	Total P (ppm)	Coliform Total Per 100 ML. (M.F.)	Coliform Fecal Per 100 ML. (M.F.)
July 28, 1971							
MM71.25F	Small trickle from north bank -mostly ground seepage	2.2	1.5T	0.74	0.11	12,100	780
MM72.7T	Beauchamp Creek 200' upstream from Middle Maitland River.	1.8	1.0T	0.95	0.059	4,800	400
July 27, 1971							
MM78.6F	Drainage from farm.	2.6	1.0T	1.4	0.20	21,000	76
MM80.9T	Boyle drain sample taken 200' up stream from Maitland.	1.0	L1.0T	1.2	0.038	1,200	36
MM81.3F	Field run off.	0.6	8.0T	0.36	0.042	10,200	116
MM81.4F	Field run off. Approx. V=1 fps	0.6	1.0T	0.76	0.038	3,500	180
MM83.3T	Sample taken 200' upstream of small tributary coming in from S.S.E.	2.4	1.5T	0.94	0.29	3,700	72
MM83.58W	12"ø culvert under old bridge -small steady flow	L0.5	L1.0T	0.31	0.008	4,300	52
MM83.58F	Farm drainage ditch.	0.8	3T	0.58	0.041	1,100	44
MM84.3T	Sample taken 150' upstream from small tributary V approximately 5fps.	3.8	40	1.9	0.079	3,100	64

July 21, 1971 Mile Pt.	Description Middle Maitland River Survey "Outfalls"	5-Day BOD (ppm)	S. S. or Turb. Units	Total N (ppm)	Total P (ppm)	Coliform Total Per 100 ML. (M.F.)	Coliform Fecal Per 100 ML. (M.F.)
MM85.2W	24"ϕ conduit	- - - - - - - - - Dry - No Sample - - - - - - - - - - - -					
MM85.3F	Field drain to river	- - - - - - - - - Dry - No Sample - - - - - - - - - - - -					
MM85.7F	Drainage ditch at bridge	2.4	70	1.0	0.19	6,700	44
MM85.9W	Drainage tile 6"ϕ	2.0	460	2.4	0.48	2,100	0
MM86.2G	Flow from ground	2.4	3.0	1.7	0.55	7,000	1,000
MM86.3W	Drain from barn	- - - - - - - - - Dry - No Sample - - - - - - - - - - - -					
MM86.9W	Outfall adjacent to chicken barn	G73	75	9.4	1.4	230,000	9,000
	Nitrite 0.002 ppm - Nitrate 0.01 ppm - ABS L0.5 ppm Free Ammonia 1.3 ppm - Soluable Phosphorus 0.011 ppm						
MM87.0F	Manure pile on bank	- - - - - - - - - Dry - No Sample - - - - - - - - - - - -					
July 20, 1971							
MM88.35G	5' wide gulley - dry at time of survey	- - - - - - - - - Dry - No Sample - - - - - - - - - - - -					
MM88.6F	Small creek from field run off sample taken 50' upstream.	1.0	2	0.76	0.14	1,100	48
MM89.2W	8"ϕ storm tile	4.2	25	0.78	0.049	2,400	0
MM89.3F	Field run off.	0.8	10	0.44	0.030	210	0
MM89.9T1	Chapman drain - sample taken 200' upstream of Maitland	5.5	60	1.6	0.36	500	0
	Nitrite 0.004 ppm - Nitrate 0.35 ppm Free Ammonia 0.36ppm - Soluable Phosphorus 0.087ppm						

Mile Pt.	Middle Maitland River Survey "Outfalls"	5-Day BOD (ppm)	S. S. or Turb. Units	Total N (ppm)	Total P (ppm)	Coliform Total Per 100 ML. (M.F.)	Coliform Fecal Per 100 ML. (M.F.)
July 21, 1971	Description						
MM89.9T$_2$	Chapman drain above lagoon outfall	6.0	25	4.5	0.074	4,000	80
		Free Ammonia 3.6ppm - Soluable Phosphorus 0.005ppm ABS 10.5 ppm					
July 20, 1971							
MM90.15W	8"ϕ crockery tile drain 50' from river edge.	1.0	10	0.61	0.034	6,400	0
MM90.2F	Recent remains of manure pile on bank of river.	- - - - - - - - - Dry - No Sample - - - - - - - - - - - - -					
MM90.7F	Field run off - seepage could not get sample.	- - - - - - - - - Dry - No Sample - - - - - - - - - - - - -					
MM91.4F	Small ground seepage	- - - - - - - - - Dry - No Sample - - - - - - - - - - - - -					
MM91.8T	Tributary south side sample 100' upstream	4.0	600	3.4	0.41	3,800	200
MM92.2W	Tile south of railway bridge.	3.0	10	+ ABS - L0.5ppm	+	11,400	1,030
MM92.5W	Tile - suspected tank effluent.	100	200	28 ABS - 32ppm	39	11,400	3,900
MM92.6W-A	Tile at Spinrite Yarns -flowing red -small flow	1.4	35	1.4 ABS - L0.5ppm	0.068	1	1
MM92.6W-B	Tile at Spinrite Yarns -small flow	120	25	1.4 ABS - L0.5ppm	0.14	1	1

+ sample exhausted

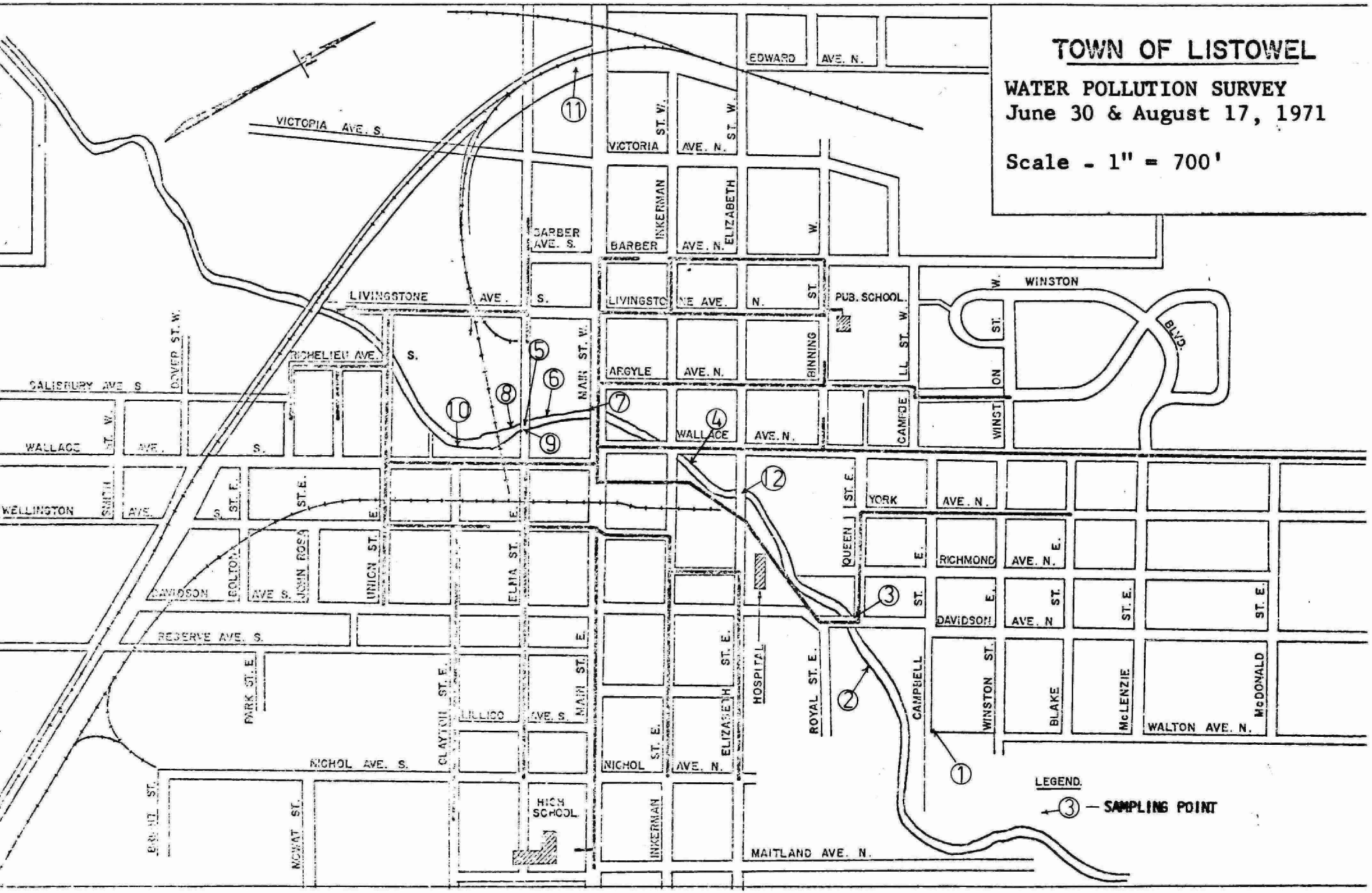
Mile Pt.	Description Middle Maitland River Survey "Outfalls"	5-Day BOD (ppm)	S. S. or Turb. Units	Total N (ppm)	Total P (ppm)	Coliform Total Per 100 ML. (M.F.)	Coliform Fecal Per 100 ML. (M.F.)
MM92.6W-C	Tile at Spinrite Yarns -flowing hot and yellow -flow varies greatly	G148	50	8.4	1.4	9,100	1
MM93.6F	-ground seepage -very black in colour -at Listowel town limits -plenty of debris -cattle still have access to stream	2.0	90	1.4	0.17	610	40
MM93.6T	-small stream from south side of river.	2.2	1	0.41	0.037	11,600	44
July 19, 1971							
MM93.7G	-ground seepage	1.2	10	0.42	0.046	13,000	16
MM93.85G	-ground seepage	1.0	25	0.36	0.055	1,100	0
MM94.2W	18-inch diameter corrugated pipe -trickle - no sample taken	- - - - - - - - - Dry - No Sample - - - - - - - - - - - - -					
MM94.25W	12"ø field tile -small trickle	2.8	35	0.80	0.14	6,200	300
MM94.3T	50' upstream sample taken -tributary comes in from north	44.0	160	3.2	0.55	4,200	44
MM94.4F	Field run off	5.0	50	1.3	0.12	2,200	40

A P P E N D I X B

MAP OF

THE

TOWN OF LISTOWEL


TOWN OF LISTOWEL
WATER POLLUTION SURVEY
June 30 & August 17, 1971
Scale - 1" = 700'
VICTORIA AVE. S.
LIVINGSTONE AVE. S.
WALLACE AVE. S.
WELLINGTON AVE. S.
DAVIDSON AVE. S.
RESERVE AVE. S.
NICHOL AVE. S.
MAITLAND AVE. N.
EDWARD AVE. N.
VICTORIA AVE. N.
BARBER AVE. N.
LIVINGSTONE AVE. N.
ARGYLE AVE. N.
WALLACE AVE. N.
YORK AVE. N.
RICHMOND AVE. N.
DAVIDSON AVE. N.
WALTON AVE. N.
NICHOL AVE. N.
WINSTON BLVD.
PUB. SCHOOL
HIGH SCHOOL
HOSPITAL
ROYAL ST. E.
CAMPBELL ST. E.
MAIN ST. W.
MAIN ST. E.
ELIZABETH ST. E.
INKERMAN ST. W.
ELIZABETH ST. W.
DOVER ST. W.
SMITH ST. W.
BOLTON ST. E.
JOHN ROSS ST. E.
UNION ST. E.
ELMA ST. E.
CLAYTON ST. E.
PARK ST. E.
NEWAT ST.
BINNING ST.
CAMPBELL ST.
QUEEN ST. E.
WINSTON ST.
BLAKE ST.
McLENZIE ST.
McDONALD ST.
RICHELIEU AVE.
SALISBURY AVE.
LEGEND.
③ — SAMPLING POINT

A P P E N D I X C

SIGNIFICANCE

OF

LABORATORY ANALYSES

APPENDIX C

SIGNIFICANCE OF LABORATORY ANALYSES

All of the laboratory tests included in the report were performed at the Ontario Water Resources Commission, Division of Laboratories.

A) CHEMICAL ANALYSES

Anionic Detergent

The test for alkyl benzene sulphonate (ABS) and reported as anionic detergent is generally employed to indicate the presence of discharges of wastewater. The popular use of synthetic detergents for general cleaning purposes has resulted in the incidence of residual ABS in streams. As an objective, the ABS concentration should not exceed 0.5 ppm in water used for domestic purposes.

Biochemical Oxygen Demand, (BOD_5)

The biochemical oxygen demand (BOD_5) indicates the amount of oxygen required for the stabilization of decomposable organic matter present in sewage or polluted water. The completion of the laboratory test requires five days at a temperature of 20°C. The Commission's water quality objective is an upper limit of 4 ppm.

Total Kjeldahl

Total kjeldahl is a measure of the total nitrogenous matter present except that measured as nitrite and nitrate. The total kjeldahl less the ammonia nitrogen gives a measure of the organic nitrogen present. Ammonia and organic nitrogen determinations are

important in assessing the availability of nitrogen for biochemical utilization. The normal range for total kjeldahl is 0.1 - 0.5 ppm.

Phosphorus

This element is commonly found in nature in the form of phosphates (PO_4). Raw or treated sewage, some industrial wastes, and agricultural drainage contain significant concentrations of phosphates. The laboratory provides two phosphorus determinations: total phosphorus and soluble phosphorus. Total phosphorus includes orthophosphate, polyphosphate and organic phosphorus, while soluble phosphorus represents orthophosphates only.

Solids

The laboratory tests determine the total and suspended solids in a sample. The value for dissolved solids is determined by taking the mathematical difference between the total and suspended solids.

The concentration of suspended solids is generally the most significant of the solids analyses in regard to water quality. The effects of suspended solids in water are reflected in difficulties associated with water purification, deposition in streams, and injury to the habitat of fish.

Turbidity

Turbidity is due to fine material in suspension which may not be of sufficient size to be seen as individual particles by the naked eye, but which reduces the passage of light through the liquid. High turbidity is undesirable in natural waters, particularly those which are used for recreational purposes. It is an expression of

the optical property of a sample and results are reported in Jackson Turbidity Units (JTU).

B) BACTERIOLOGICAL ANALYSES

COLIFORMS

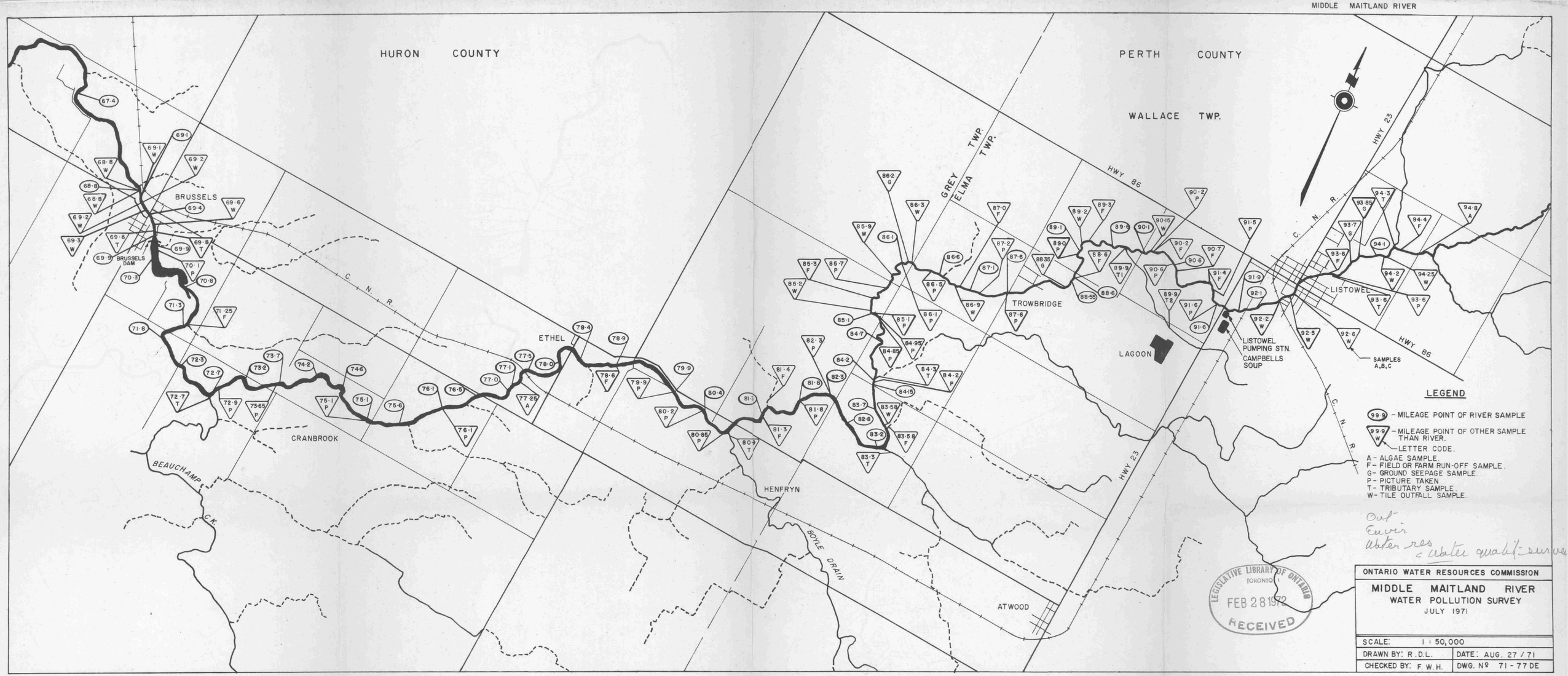
1) Total

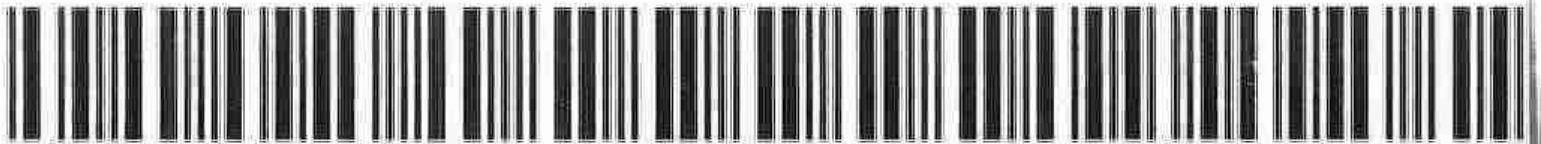
The Membrane Filter technique was used to obtain a direct enumeration of coliform organisms. The sum of these organisms, that are normal inhabitants of the intestines of man and other warm-blooded animals and soils, is termed the 'Total Coliform' count. They are always present in large numbers in sewage, but generally minimal in other stream pollutants.

The results of the examinations are reported as "MF Coliform count per 100 ml". The objective is that the total coliform count in water should not exceed 2,400 organisms per 100 ml.

2) Fecal

Fecal coliforms are found only in the intestines of man and other warm-blooded animals. Their presence indicates that wastes from these sources have gained access to the sampled waters.

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